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WHAT WE CLAIM IS:

- Sub a⁵* → 1. A target tracking device for target tracking missiles comprising an electro-optical seeker assembly (16) mounted in a missile structure (10) through gimbals (18,22), said seeker assembly responding to target radiation and providing target deviation signals, and actuator means (36,38) for causing said seeker assembly (16) to track the target, said actuator means being controlled by said target deviation signals
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- 15 **wherein**
- (a) said electro-optical seeker assembly (16) is pivotally mounted in said missile structure (10) about a roll axis (24) and a pitch axis (20) only, said pitch axis being orthogonal to said roll axis (24),
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- (b) first and second pick-off means (28,34) are provided for picking off angles of rotation of said seeker assembly (16) about said roll and pitch axes (24 and 20, respectively), said first and second pick-off means (28,34) providing pick-off signals,
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- (c) structure-fixed inertial sensor means (48) are provided for measuring the angular rates about three mutually orthogonal axes and providing angular rate signals,
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- (d) said target deviation signals from said seeker assembly (16), said pick-off signals from said pick-off means (28,34) and said angular rate signals from said inertial sensor means (48) are applied to a
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24

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computer (76), which is programmed to define a seeker reference system with three degrees of freedom

- which is de-coupled from movements of the missile and the seeker assembly (16),
- the roll movement of which is zero, and
- which is caused to track a target detected by said seeker assembly (16),

(e) said computer (76), in addition, has means (80) for generating positioning commands for said actuator means (36,38) depending on the position of said seeker reference system.

2. A device as claimed in claim 1, wherein said means (80) for generating said positioning command comprise case discriminating logic means (198) for selecting one of a plurality of specific positioning commands, when the target approaches said roll axis.

3. A seeker as claimed in claim 2, wherein

(a) a first signal, which represents ~~the~~ absolute amount of the angular rate of ~~the~~ target relative to the missile, a second signal, which represents ~~the~~ pitch angle, and a third signal, which represents the target deviation, are applied to said case discriminating logic means (198),

(b) said ^{case}~~phase~~ discriminating logic means (198) are arranged to combine said first, second and third signals such that

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- the positioning command about said roll axis is limited only by the maximum control rate of said actuator means, if

5

- said pitch angle exceeds an upper threshold

- said pitch angle is larger than a lower threshold but smaller than said upper threshold and said absolute amount of ~~the~~ relative angular rate is larger than an angular rate threshold, or

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- said target deviation is larger than an upper target deviation threshold,

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- said positioning command about said roll axis commands a ^{control} ~~control~~ rate of zero, if

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- said pitch angle is smaller than said lower pitch angle threshold,

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- said pitch angle is larger than said lower pitch angle threshold and smaller than said upper pitch angle threshold, said absolute amount of the relative angular rate is smaller than said angular rate threshold, and the absolute amount of said target deviation is smaller than a lower target deviation threshold, and

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- said positioning command about said roll axis increases as a function of said target deviation progressively within the range between said lower and upper target deviation thresholds, if

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- said absolute amount of the relative angular rate is smaller than the angular rate threshold, and the absolute amount of the target deviation lies between said lower and upper target deviation thresholds.

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26

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